

CLAIMS

I claim:

1. A hot air furnace comprising:
 - a. a heat exchanging chamber wherein comfort air is heated by being forced through the chamber;
 - b. a blower for urging comfort air through the heat exchanging chamber,
 - c. a heat exchanger assembly located in the heat exchanging chamber and in heat exchanging contact with comfort air passing through the heat exchanging chamber, said heat exchanger comprising:
 - i. a combustion member including a substantially cylindrical wall portion, wherein the combustion member communicates with a burner, further wherein an insulating material is affixed to the inside of the cylindrical wall portion,
 - ii. a condenser portion positioned in the flow path of comfort air upstream from the combustion member in the heat exchanging chamber,
 - iii. a transfer member connected to the end of the combustion member opposite of the burner and to providing a path for combustion gases from the combustion member to the condenser,
 - iv. a diffuser member mounted within the combustion member wherein the diffuser is positioned in the combustion member to inhibit the flame generated by the burner from extending into the transfer member, and
 - d. wherein the burner includes a combustion air blower which urges combustion gases through the heat exchanging assembly to an exhaust outlet.
2. The apparatus of claim 1 wherein the insulating material is a blanket.

3. The apparatus of claim 1 wherein the combustion air blower intakes air from a air intake chamber.
- 5 4. The apparatus of claim 3 wherein the air intake chamber includes a air feed from outside the heating structure such that air being fed to the blower is a mixture of air from outside the heating structure and air from inside the heating structure.
5. The apparatus of claim 1 wherein the burner is a natural gas-fired burner.
- 10 6. The apparatus of claim 1 wherein the burner is oil-fired.
7. The apparatus of claim 1 wherein the combustion gases produced exit the combustion member into the transfer member and further into the condenser where the gases condense from their gaseous state.
- 15 8. The apparatus of claim 1 wherein a condensate collector box communicates with the condenser, said condensate collector box including a pressure relief switch which shuts down the burner when excessive pressure is detected at the condensate collector box.
- 20 9. The apparatus of claim 1 wherein a high temperature cut off switch is in communication with the inside of the heat exchanging chamber, wherein the high temperature cut off switch shuts down the burner when excessive temperature is detected in the heat exchanging chamber.
- 25 10. The apparatus of claim 1 wherein a condensate collector box communicates with the condenser, said condensate collector box including an auxiliary limit switch which operates to shut down the burner if excessive temperatures are detected at the condensate box.
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11. The apparatus of claim 1 wherein said combustion air blower is activated for sufficient time prior to burner ignition such that the heat exchanging assembly is "purged" before burner operation.

5 12. The apparatus of claim 1 wherein said combustion air blower continues operating after the burner is extinguished to "purge" the heat exchanging assembly upon terminating burner operation.

13. A hot air furnace comprising:

10 a. a heat exchanging chamber wherein comfort air is heated by being forced through the chamber;
b. a blower for urging comfort air through the heat exchanging chamber;
c. a heat exchanger assembly located in the heat exchanging chamber and in heat exchanging contact with comfort air passing through the heat
15 exchanging chamber, said heat exchanger comprising:

i. a combustion member including a substantially cylindrical wall portion, wherein the combustion member communicates with a burner, further wherein an insulating blanket is affixed to the inside of the cylindrical wall portion,
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ii. a condenser portion positioned in the flow path of comfort air upstream from the combustion member in the heat exchanging chamber,

25 iii. a transfer member connected to the end of the combustion member opposite of the burner and to providing a path for combustion gases from the combustion member to the condenser,

iv. a diffuser member mounted within the combustion member wherein the diffuser is positioned in the combustion

member to inhibit the flame generated by the burner from
extending into the transfer member, and

- d. wherein the burner includes a combustion air blower which urges
combustion gases through the heat exchanging assembly to an exhaust
outlet.

14. The apparatus of claim 13 wherein the intake chamber includes a vent which
leads outside the heating structure and wherein the feed air is a combination of
the outside air and air present within the heating structure.

15. The apparatus of claim 13 wherein the combustion air blower intakes air from a
air intake chamber.

16. The apparatus of claim 13 wherein the air intake chamber includes a air feed from
outside the heating structure such that air being fed to the blower is a mixture of
air from outside the heating structure and air inside the heating structure.

17. The apparatus of claim 13 wherein said burner is a natural gas-fired burner.

18. The apparatus of claim 13 wherein the burner is oil-fired.

19. The apparatus of claim 13 wherein substantially all of the combustion gases
produced exit the combustion member into the transfer member to the condenser
where in the condenser the gases condense from their gaseous state.

20. The apparatus of claim 13 wherein a condensate collector box communicates with
the condenser, said condensate collector box including a pressure relief switch
which shuts down the burner when excessive pressure is detected at the
condensate collector box.

21. The apparatus of claim 13 wherein a high temperature cut off switch is in communication with the inside of the heat exchanging chamber, wherein the high temperature cut off switch shuts down the burner when excessive temperature is detected in the heat exchanging chamber.

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22. The apparatus of claim 13 wherein a condensate collector box communicates with the condenser, said condensate collector box including an auxiliary limit switch which operates to shut down the burner if excessive temperatures are detected at the condensate box.

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23. The apparatus of claim 13 wherein said combustion air blower is activated for sufficient time prior to burner ignition such that the heat exchanging assembly is "purged" before burner operation.

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24. The apparatus of claim 13 wherein said combustion air blower continues operating after the burner is extinguished to "purge" the heat exchanging assembly upon terminating burner operation.

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25. A hot air furnace comprising:

a. a heat exchanging chamber wherein comfort air is heated by being forced through the chamber;

b. a blower for urging comfort air through the heat exchanging chamber,

c. a heat exchanger assembly located in the heat exchanging chamber and in heat exchanging contact with comfort air passing through the heat

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exchanging chamber, said heat exchanger comprising:

i. a combustion member including a substantially cylindrical wall portion, wherein the combustion member communicates with a burner, further wherein an insulating material is affixed to the inside of the cylindrical wall portion,

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- ii. a condenser portion positioned in the flow path of comfort air upstream from the combustion member in the heat exchanging chamber,
 - iii. a transfer member connected to the end of the combustion member opposite of the burner and to providing a path for combustion gases from the combustion member to the condenser,
 - iv. a diffuser member mounted within the combustion member wherein the diffuser is positioned in the combustion member to inhibit the flame generated by the burner from extending into the transfer member, and
- d. wherein the burner includes a combustion air blower which urges combustion gases through the heat exchanging assembly to an exhaust outlet said combustion air blower intakes air from an air intake chamber wherein the chamber includes a vent which leads outside the heating structure and wherein the feed air is a combination of the outside air and air present within the heating structure.
26. The apparatus of claim 25 wherein said insulating material is a blanket.
27. The apparatus of claim 25 wherein said burner is a natural gas-fired burner.
28. The apparatus of claim 25 wherein the burner is oil-fired.
29. The apparatus of claim 25 wherein substantially all of the combustion gases produced exit the combustion member into the transfer member to the condenser where in the condenser the gases condense from their gaseous state.
30. The apparatus of claim 25 wherein a condensate collector box communicates with the condenser, said condensate collector box including a pressure relief switch

which shuts down the burner when excessive pressure is detected at the condensate collector box.

31. The apparatus of claim 25 wherein a high temperature cut off switch is in communication with the inside of the heat exchanging chamber, wherein the high temperature cut off switch shuts down the burner when excessive temperature is detected in the heat exchanging chamber.
32. The apparatus of claim 25 wherein a condensate collector box communicates with the condenser, said condensate collector box including an auxiliary limit switch which operates to shut down the burner if excessive temperatures are detected at the condensate box.
33. The apparatus of claim 25 wherein said combustion air blower is activated for sufficient time prior to burner ignition such that the heat exchanging assembly is "purged" before burner operation.
34. The apparatus of claim 1 wherein said combustion air blower continues operating after the burner is extinguished to "purge" the heat exchanging assembly upon terminating burner operation.
35. A hot air furnace comprising:
- a. a heat exchanging chamber wherein comfort air is heated by being forced through the chamber;
 - b. a blower for urging comfort air through the heat exchanging chamber,
 - c. a heat exchanger assembly located in the heat exchanging chamber and in heat exchanging contact with comfort air passing through the heat exchanging chamber, said heat exchanger comprising:
 - i. a combustion member including a substantially cylindrical wall portion, wherein the combustion member

communicates with a burner, further wherein an insulating blanket is affixed to the inside of the cylindrical wall portion,

5 ii. a condenser portion positioned in the flow path of comfort air upstream from the combustion member in the heat exchanging chamber said condenser portion including a condensate collector box at its furthest downstream location, further wherein said condenser box communicates with a pressure relief switch which shuts down the burner
10 when excessive pressure is detected at the condensate collector box, said condensate collector box further communicates with an auxiliary switch which operates to shut down the burner when excessive temperature is detected at the condensate collector box,

15 iii. a transfer member connected to the end of the combustion member opposite of the burner and to providing a path for combustion gases from the combustion member to the condenser,

20 iv. a diffuser member mounted within the combustion member wherein the diffuser is positioned in the combustion member to inhibit the flame generated by the burner from extending into the transfer member, and

d. wherein the burner includes a combustion air blower which urges combustion gases through the heat exchanging assembly where the gases
25 exit the combustion member and enter into the transfer member to the condenser where the gases condense from their gaseous state, said combustion air blower intaking air from an air intake chamber wherein the chamber includes a vent which leads outside the heating structure and wherein the feed air is a combination of the outside air and air present
30 within the heating structure, wherein said combustion air blower is

activated for sufficient time prior to burner ignition such that the heat exchanging assembly is "purged" before burner operation and wherein said combustion air blower continues operating after the burner is extinguished to "purge" the heat exchanging assembly upon terminating burner operation.

36. A unit heater comprising:

- a. a heat exchanging chamber wherein comfort air is heated by being forced through the chamber;
- b. a blower for urging comfort air through the heat exchanging chamber,
- c. a heat exchanger assembly located in the heat exchanging chamber and in heat exchanging contact with comfort air passing through the heat exchanging chamber, said heat exchanger comprising:
 - i. a combustion member including a substantially cylindrical wall portion, wherein the combustion member communicates with a burner, further wherein an insulating material is affixed to the inside of the cylindrical wall portion,
 - ii. a condenser portion positioned in the flow path of comfort air upstream from the combustion member in the heat exchanging chamber,
 - iii. a transfer member connected to the end of the combustion member opposite of the burner and to providing a path for combustion gases from the combustion member to the condenser,
 - iv. a diffuser member mounted within the combustion member wherein the diffuser is positioned in the combustion member to inhibit the flame generated by the burner from extending into the transfer member, and

- d. wherein the burner includes a combustion air blower which urges combustion gases through the heat exchanging assembly to an exhaust outlet, and
- e. an air-directing vent at one end of the unit heater wherein comfort air passing through the vent can be directed to desired locations.

37. The unit heater of claim 36 wherein said air directing vent includes a set of horizontal louvers to direct comfort air in a direction horizontal to the flow of air over the louvers and a set of vertical louvers to direct comfort air in a direction vertical to the flow of comfort over the louvers.

38. A unit heater comprising:

- a. a heat exchanging chamber wherein comfort air is heated by being forced through the chamber;
- b. a blower for urging comfort air through the heat exchanging chamber,
- c. a heat exchanger assembly located in the heat exchanging chamber and in heat exchanging contact with comfort air passing through the heat exchanging chamber, said heat exchanger comprising:

- i. a combustion member including a substantially cylindrical wall portion, wherein the combustion member communicates with a burner, further wherein an insulating blanket is affixed to the inside of the cylindrical wall portion,
- ii. a condenser portion positioned in the flow path of comfort air upstream from the combustion member in the heat exchanging chamber said condenser portion including a condensate collector box at its furthest downstream location, further wherein said condenser box communicates with a pressure relief switch which shuts down the burner when excessive pressure is detected at the condensate

collector box, said condensate collector box further communicates with an auxiliary switch which operates to shut down the burner when excessive temperature is detected at the condensate collector box,

5 iii. a transfer member connected to the end of the combustion member opposite of the burner and to providing a path for combustion gases from the combustion member to the condenser,

10 iv. a diffuser member mounted within the combustion member wherein the diffuser is positioned in the combustion member to inhibit the flame generated by the burner from extending into the transfer member, and

d. wherein the burner includes a combustion air blower which urges combustion gases through the heat exchanging assembly where the gases exit the combustion member and enter into the transfer member to the condenser where the gases condense from their gaseous state, said combustion air blower intaking air from an air intake chamber wherein the chamber includes a vent which leads outside the heating structure and wherein the feed air is a combination of the outside air and air present within the heating structure, wherein said combustion air blower is activated for sufficient time prior to burner ignition such that the heat exchanging assembly is "purged" before burner operation and wherein said combustion air blower continues operating after the burner is extinguished to "purge" the heat exchanging assembly upon terminating burner operation, and

25 e. an air-directing vent at one end of the unit heater wherein comfort air passing through the vent can be directed to desired locations wherein the air-directing vent includes a set of horizontal louvers to direct comfort air in a direction horizontal to the flow of air over the horizontal louvers and a

set of vertical louvers to direct comfort air in a direction vertical to the
flow of comfort air over the vertical louvers